

REMARKS

Favorable reconsideration of this application in light of the following discussion is respectfully requested.

Claims 1-12 are presently active in this case. The present Amendment amends Claims 1, 4-5; and adds new Claims 10-12 without introducing any new matter.

In the outstanding Office Action, Claims 1-2 and 5-7 were rejected under 35 U.S.C. §102(e) as anticipated by Kawato (U.S. Patent Publication No. 2004/0061978) or under 35 U.S.C. §103(a) as unpatentable over Kawato in view of Kagami et al. (U.S. Patent Publication No. 2005/0068691, herein "Kagami"). Claims 3 and 8-9 were rejected under 35 U.S.C. §103(a) as unpatentable over Kawato and Kagami in view of Katti et al. (U.S. Patent No. 6,707,084, herein "Katti").

To correct minor formalities in the claims, Claims 1 and 4-5 are amended. Since the changes are only formal in nature, they are not believed to raise a question of new matter. Furthermore, the Specification is amended to correct a minor error. The change to the Specification finds non-limiting support from page 1, line 23 to page 2, line 6.

To vary the scope of protection recited in the claims, new Claims 10-12 are added. New independent Claim 10 recited similar features to independent Claim 7, and further recites a feature regarding the non-magnetic layer configured to decouple exchange coupling.¹ New Claims 11 and 12 recite the same features as dependent Claims 8 and 9, but depend upon new Claim 10. Since the new claims find non-limiting support in the disclosure as originally filed, they are not believed to raise a question of new matter.²

¹ Finds non-limiting support in Applicants' specification, for example at page 8, lines 12-19, in original Claim 1, and in Figures 4-5.

² See MPEP 2163.06 stating that "information contained in any one of the specification, claims or drawings of the application as filed may be added to any other part of the application without introducing new matter."

In response to the rejection of Claims 1-2 and 5-7 under 35 U.S.C. §102(e) and §103(a), Applicants respectfully request reconsideration of these rejections and traverse the rejections, as discussed next.

Briefly recapitulating, Applicants' Claim 1 relates to a spin-tunnel transistor, including an emitter; a collector formed adjacent to the emitter; a base formed between the emitter and the collector and having a magnetization pinned layer of ferromagnetic material, a magnetization free layer of ferromagnetic material and a nonmagnetic layer between the magnetization pinned layer of ferromagnetic material and the magnetization free layer of ferromagnetic material, the magnetization pinned layer having a magnetization substantially fixed in an applied magnetic field, the magnetization free layer having a magnetization substantially free to rotate under the applied magnetic field, and the nonmagnetic layer being configured to decouple exchange coupling between the magnetization free layer of ferromagnetic material and the magnetization pinned layer of ferromagnetic material; and a ***tunnel barrier layer of antiferromagnetic material*** formed between the magnetization pinned layer of ferromagnetic material and the emitter or between the collector and the magnetization pinned layer of ferromagnetic material and provided with an exchange coupling with adjoining one of the magnetization pinned layer of ferromagnetic material, the magnetization of the magnetization pinned layer of ferromagnetic material being fixed by the exchange coupling between the magnetization pinned layer of ferromagnetic material and the tunnel barrier of antiferromagnetic material.

As explained in Applicants' specification at page 5, lines 8-10, Applicants' invention improves upon background spin-tunnel transistors, since a large collector current and high magneto-resistance ratio (MR ratio) is provided, with the magnetization pinned layer having a stable magnetization. Furthermore, the tunnel barrier layer of antiferromagnetic material between the magnetization pinned layer of ferromagnetic material and the emitter/collector,

provided with an exchange coupling with the adjoining magnetization pinned layer of ferromagnetic material, can ensure a high transmission of electrons, while fixing the magnetization of the magnetization pinned layer.

Applicants respectfully submit that the reference Kagami, used by the outstanding Office Action to form the 35 U.S.C. §103(a) rejection, does not qualify as prior art. The reference Kagami was filed on September 21, 2004. The present Application was filed on September 24, 2003, which is before Kagami's §102(e) date of September 21, 2004. Accordingly, Applicants respectfully request withdrawal of all the rejections based on the reference Kagami.

The reference Kawato describes a differential detection read sensor for magnetic recording, where a base coat alumina layer 102 has a thickness of 5 μ m, and on the base coat layer 102, there is a magnetic shield 11a of 3 μ m thickness and an electrode 28a of 10nm thickness.³ However, Kawato fails to teach or suggest a tunnel barrier layer of antiferromagnetic material, as recited in Applicants' independent Claims 1 and 7. Furthermore, Kawato's sensor does not need a tunnel barrier layer, since the magnetic recording element does not need a high transmission ratio of electrons. As explained in Applicants' specification at page 9, line 6-9, "the tunnel barrier layer 9 of dielectric material is thin enough to ensure tunnel conduction through a tunnel junction between the adjacent two layers." The outstanding Office Action asserts at page 3, lines 4-8 that Kawato's layer 102 reads upon a tunnel barrier layer. Applicants respectfully disagree, since Kawato's base coat alumina layer 102 **is not a tunnel layer**, at least because the thickness of this layer 102 of 5 μ m does not permit operation as a tunnel layer. In a specific, non-limiting embodiment of Applicants' specification, described at page 15, lines 3-10, a tunnel barrier layer of about 1nm thickness is disclosed. Accordingly, a base coat alumina layer 102 with the thickness of

³ See Kawato in the Abstract and at page 5, paragraph 50, lines 1-8 and in corresponding Figure 7.

5 μ m, as taught by Kawato, is not a tunnel barrier layer, as recited in independent Claims 1 and 7.

Regarding the rejection of Claims of dependent Claims 3 and 8-9 under 35 U.S.C. §103(a), since the rejection of independent Claims 1 and 7 is believed to be overcome, the rejection of dependent Claims 3 and 8-9 is also believed to be overcome. Furthermore, the applied reference Katti does not remedy the deficiencies of Kawato. Katti describes a magnetic memory cell adding an antiferromagnet,⁴ and is also silent on the claimed tunnel barrier layer. Therefore, even assuming *in arguendo* that the combination of Kawato and Katti is proper, the combination fails to teach every element of the claimed invention. Specifically, the combination fails to teach the claimed tunnel barrier layer. Accordingly, Applicants respectfully traverse, and request reconsideration of, this rejection based on these patents.⁵

Consequently, in view of the present amendment, no further issues are believed to be outstanding in the present application, and the present application is believed to be in condition for formal Allowance. A Notice of Allowance for Claims 1-12 is earnestly solicited.

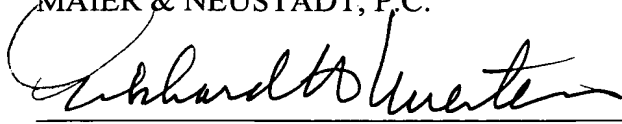
⁴ See Katti in the Abstract.

⁵ See MPEP 2142 stating, as one of the three "basic criteria [that] must be met" in order to establish a *prima facie* case of obviousness, that "the prior art reference (or references when combined) must teach or suggest all the claim limitations," (emphasis added). See also MPEP 2143.03: "All words in a claim must be considered in judging the patentability of that claim against the prior art."

Should the Examiner deem that any further action is necessary to place this application in even better form for allowance, the Examiner is encouraged to contact Applicants' undersigned representative at the below listed telephone number.

Respectfully submitted,

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